AF/1753

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
BRUCE E. GNADE
ROBERT M. WALLACE

Serial No.: 10/051,970

Filed: January 18, 2002

For: METHOD FOR USING FIELD EMITTER ARRAYS IN CHEMICAL AND BIOLOGICAL HAZARD MITIGATION AND REMEDIATION

Examiner: Kishor Mayekar

Group Art Unit: 1753

Att'y Docket: 4380.000300

Customer No 023720

APPEAL BRIEF

CERTIFICATE OF MAILING
37 C.F.R. 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date below:

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Kathy Danar — Signature

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellant hereby submits this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated December 1, 2004. A Notice of Appeal was filed March 31, 2005, so this Appeal Brief is believed to be timely filed.

A check in the amount of $500.00 is attached hereto. Should the check be inadvertently omitted and/or should additional fees be required the Commissioner is authorized to deduct the required fees from **Williams, Morgan & Amerson's P.C. Deposit Account 50-0786/4380.000300.**

I. REAL PARTY IN INTEREST

The present application is owned by the University of North Texas. The assignment of the present application to the University of North Texas is recorded at Reel 012517, Frame 0826.

II. RELATED APPEALS AND INTERFERENCES

Applicant is not aware of any related appeals and/or interferences that might affect the outcome of this proceeding.

III. STATUS OF THE CLAIMS

Claims 11-60 are pending in the application. Claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 stand rejected under 35 U.S.C. 102(b) as being anticipated by Chalamala, et al, "Interaction of H_2O with Active Spindt-Type Molybdenum Field Emitter Arrays," J. Vac. Sci. Tech. vol. 17, pgs. 303-305, 1999, hereinafter referred to as the first Chalamala publication. Claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 stand rejected under 35 U.S.C. 102(b) as being anticipated by Chalamala, et al, "Effect of O_2 on the Electronic Emission Characteristics of Active Molybdenum Field Emission Cathode Arrays," J. Vac. Sci. Tech. B vol. 16, pgs. 2859-2865, 1998, hereinafter referred to as the second Chalamala publication. Claims 12-13, 17-18, 22-23, 25, 27-28, 30-40, 42-43, 45, 47-48, and 51-60 stand rejected under 35 U.S.C. 103(a) as being unpatentable over either the first Chalamala publication or the second Chalamala publication in view of admitted prior art.

IV. STATUS OF AMENDMENTS

There were no amendments after the final rejections.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claims 11, 16, 21, 31, 36, 41, 46, 51, and 56 set forth, among other things, operating a low-power field emitter array (FEA) to generate at least one of a high electric field and a high electron flux, exposing the low-power field emitter array (FEA) to at least one gas, and generating at least one radical species from the at least one gas exposed to the at least one of the high electric field and the high electron flux. For example, Figure 2(a) shows a small portion of a field emitter array (FEA) that may be used to generate a radical species (O^+) from a gas (O_2) exposed to a high electric field and electron flux. See Patent Application, page 12, line 14 – page 13, line 2. Additional examples are presented in Figures 3-6 and related discussion in the specification.

Claim 11 sets forth reacting the at least one radical species with at least one of a chemical toxin and a biological toxin. Claim 16 sets forth reacting the at least one radical species with at least one of a chemical toxin and a biological toxin. Claim 21 sets forth dissociating the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

Claims 26, 31, 36, 41, 46, 51, and 56 set forth, among other things, operating a low-power field emitter array (FEA) with voltages of no more than about 1000 V to generate at least one of a high electric field and a high electron flux, such as discussed above. Claims 26, 31, 36, and 41 also set forth exposing the low-power field emitter array (FEA) to at least one of a chemical toxin and a biological toxin, and dissociating the at least one of the chemical toxin and

the biological toxin exposed to the at least one of the high electric field and the high electron flux. Claims 41, 46, 51, and 56 set forth exposing the field emitter array (FEA) to at least one of a chemical toxin and a biological toxin and ionizing the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

As used herein and in accordance with common usage in the art, the terms "chemical toxin" and "biological toxin" refer to materials that are particularly harmful and/or deadly to humans. Examples of these biological and/or chemical agents and/or pathogens and/or toxins may include Sarin $((CH_3)_2CHOP(O)FCH_3)$, Soman $((CH_3)_3CHCH_3OP(O)FCH_3)$, VX $(CH_3P(O)OC_2H_5SCH_2CH_2N(CH(CH_3)_2)_2)$, and the like. See Patent Application, page 3, ll. 10-12. Chemical plants that produce ammonia (NH_3), chlorine (Cl_2), insecticides, and the like, may store large volumes of highly toxic materials. Additionally, many manufacturing facilities (*e.g.*, manufacturing plants that use arsine, germane, diborane, and the like) store large volumes of highly toxic materials. See Patent Application, page 2, ll. 16-20.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant respectfully requests that the Board review and overturn the three rejections present in this case. The following issues are presented on appeal in this case:

(A) Whether claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 are anticipated by the first Chalamala publication;

(B) Whether claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 are anticipated by the second Chalamala publication; and

(C) Whether claims 12-13, 17-18, 22-23, 25, 27-28, 30-40, 42-43, 45, 47-48, and 51-60 are obvious over the first or second Chalamala publications in view of the admitted prior art.

VII. ARGUMENT

A. <u>Legal Standards</u>

An anticipating reference by definition must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. *In re Bond*, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. That is, there must be something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561 (Fed. Cir. 1986). In fact, the absence of a suggestion to combine is dispositive in an obviousness determination. *Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573 (Fed. Cir. 1997). The mere fact that the prior art can be combined or modified does not make the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); M.P.E.P. § 2143.01. Third, there must be a reasonable expectation of success.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991); M.P.E.P. § 2142. A recent Federal Circuit case emphasizes that, in an obviousness situation, the prior art must disclose each and every element of the claimed invention, and that any motivation to combine or

modify the prior art must be based upon a suggestion in the prior art. *In re Lee*, 61 U.S.P.Q.2d 143 (Fed. Cir. 2002). Conclusory statements regarding common knowledge and common sense are insufficient to support a finding of obviousness. *Id.* at 1434-35.

B. <u>Claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 are not anticipated by the first Chalamala publication</u>.

The first Chalamala publication is concerned with the effect of residual gases on the performance of field emitter arrays. However, this reference is completely silent with regard to chemical toxins and/or biological toxins. In particular, the first Chalamala publication is completely silent with regard to any application of field emitter arrays to the detection, mitigation, and/or remediation of chemical toxins and/or biological toxins. Thus, Appellants respectfully submit that the cited reference fails to describe or suggest reacting at least one radical species with at least one of a chemical toxin and a biological toxin, as set forth in independent claims 11 and 16. The cited reference also fails to describe or suggest exposing a low-power field emitter array (FEA) to at least one of a chemical toxin and a biological toxin and dissociating the at least one of the chemical toxin and the biological toxin exposed to at least one of a high electric field and a high electron flux formed by the low-power field inventor array (FEA), as set forth in independent claims 21, 26, 31, and 36. The cited reference also fails to describe or suggest ionizing at least one of a chemical toxin and a biological toxin exposed to at least one of a high electric field and a high electron flux, as set forth in independent claims 41, 46, 51, and 56.

In the Final Office Action, the Examiner alleges that the first Chalamala publication describes reacting at least one radical species with molybdenum or a hydrocarbon. However,

Appellants respectfully submit that neither molybdenum nor the hydrocarbons described in the first Chalamala publication are toxins as defined by the specification in accordance with common usage in the art.

Thus, Appellants respectfully submit that the present invention is not anticipated by the first Chalamala publication and request that the Examiner's rejections of claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 be REVERSED.

C. Claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 are not anticipated by the second Chalamala publication.

The second Chalamala publication is concerned with the effect of residual gases on the performance of field emitter arrays. However, this reference is completely silent with regard to chemical toxins and/or biological toxins. In particular, the second Chalamala publication is completely silent with regard to any application of field emitter arrays to the detection, mitigation, and/or remediation of chemical toxins and/or biological toxins. Thus, Appellants respectfully submit that the cited reference fails to describe or suggest reacting at least one radical species with at least one of a chemical toxin and a biological toxin, as set forth in independent claims 11 and 16. The cited reference also fails to describe or suggest exposing a low-power field emitter array (FEA) to at least one of a chemical toxin and a biological toxin and dissociating the at least one of the chemical toxin and the biological toxin exposed to at least one of a high electric field and a high electron flux formed by the low-power field inventor array (FEA), as set forth in independent claims 21, 26, 31, and 36. The cited reference also fails to describe or suggest ionizing at least one of a chemical toxin and a biological toxin exposed to at

least one of a high electric field and a high electron flux, as set forth in independent claims 41, 46, 51, and 56.

In the Final Office Action, the Examiner alleges that the second Chalamala publication describes reacting at least one radical species with molybdenum or a hydrocarbon. However, Appellants respectfully submit that neither molybdenum nor hydrocarbons described in the second Chalamala publication are toxins as defined by the specification in accordance with common usage in the art.

Thus, Appellants respectfully submit that the present invention is not anticipated by the second Chalamala publication and request that the Examiner's rejections of claims 11, 14, 16, 19, 21, 24, 26, 29, 41, 44, 46, and 49 be REVERSED.

D. <u>Claims 12-13, 17-18, 22-23, 25, 27-28, 30-40, 42-43, 45, 47-48, and 51-60 are not obvious over the first or second Chalamala publications in view of the admitted prior art</u>.

As discussed above, the first and second Chalamala publications are completely silent with regard to chemical and/or biological hazards and therefore do not teach or suggest at least the limitations related to reacting, ionizing, or dissociating a biological toxin and/or a chemical toxin. The admitted prior art also fails to teach or suggest any application of a field emitter array to the detection, mitigation, and/or remediation of chemical and/or biological hazards. Thus, Applicants respectfully submit that the Examiner has failed to make a *prime facie* case that the present invention is obvious over the cited references.

Thus, Appellants respectfully submit that the present invention is not obvious over the first or second Chalamala publications in view of the admitted prior art and request that the

Examiner's rejections of claims 12-13, 17-18, 22-23, 25, 27-28, 30-40, 42-43, 45, 47-48, and 51-60 be REVERSED.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal – claims 11-60 – are set forth in the attached "Claims Appendix."

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATED PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

In view of the foregoing, it is respectfully submitted that the Examiner erred in not allowing all claims pending in the present application, claims 11-60, over the prior art of record. The undersigned may be contacted at (713) 934-4052 with respect to any questions, comments or suggestions relating to this appeal.

Respectfully submitted,

Date: 5/6/05

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AGENT FOR APPLICANTS

CLAIMS APPENDIX

1-10. (Canceled)

11. A method comprising:

operating a low-power field emitter array (FEA) to generate at least one of a high electric field and a high electron flux;

exposing the low-power field emitter array (FEA) to at least one gas;

generating at least one radical species from the at least one gas exposed to the at least one of the high electric field and the high electron flux; and

reacting the at least one radical species with at least one of a chemical toxin and a biological toxin.

12. The method of claim 11, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

13. The method of claim 11, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

14. The method of claim 11, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with voltages of no more than about 100 V.

15. The method of claim 11, wherein exposing the low-power field emitter array (FEA) to the at least one gas comprises exposing the low-power field emitter array (FEA) to molecular oxygen (O_2).

16. A method comprising:

operating a low-power field emitter array (FEA) with voltages of no more than about 1000 V to generate at least one of a high electric field and a high electron flux;

exposing the low-power field emitter array (FEA) to at least one gas;

generating at least one radical species from the at least one gas exposed to the at least one of the high electric field and the high electron flux; and

reacting the at least one radical species with at least one of a chemical toxin and a biological toxin.

17. The method of claim 16, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

18. The method of claim 16, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

19. The method of claim 16, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with voltages of no more than about 100 V.

20. The method of claim 16, wherein exposing the low-power field emitter array (FEA) to the at least one gas comprises exposing the low-power field emitter array (FEA) to molecular oxygen (O_2).

21. A method comprising:

operating a low-power field emitter array (FEA) to generate at least one of a high electric field and a high electron flux;

exposing the low-power field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

dissociating the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

22. The method of claim 21, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

23. The method of claim 21, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

24. The method of claim 21, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with voltages of no more than about 100 V.

25. The method of claim 21, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with a cathode-to-gate distance of not more than about 1 micron (1 μm).

26. A method comprising:

operating a low-power field emitter array (FEA) with voltages of no more than about 1000 V to generate at least one of a high electric field and a high electron flux;

exposing the low-power field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

dissociating the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

27. The method of claim 26, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

28. The method of claim 26, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

29. The method of claim 26, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with voltages of no more than about 100 V.

30. The method of claim 26, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with a cathode-to-gate distance of not more than about 1 micron (1 μm).

31. A method comprising:

operating a low-power field emitter array (FEA) with gate openings in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm) to generate at least one of a high electric field and a high electron flux;

exposing the low-power field emitter array (FEA) to at least one of a chemical <u>toxin</u> and a biological toxin; and

dissociating the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

32. The method of claim 31, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

33. The method of claim 31, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

34. The method of claim 31, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with voltages of no more than about 100 V.

35. The method of claim 31, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with a cathode-to-gate distance in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm).

36. A method comprising:

operating a low-power field emitter array (FEA) with voltages of no more than about 1000 V with gate openings in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm) to generate at least one of a high electric field and a high electron flux;

exposing the low-power field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

dissociating the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

37. The method of claim 36, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

38. The method of claim 36, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

39. The method of claim 36, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with voltages of no more than about 100 V.

40. The method of claim 36, wherein operating the low-power field emitter array (FEA) comprises operating the low-power field emitter array (FEA) with a cathode-to-gate distance in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm).

41. A method comprising:

operating a field emitter array (FEA) to generate at least one of a high electric field and a high electron flux;

exposing the field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

ionizing the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

42. The method of claim 41, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

43. The method of claim 41, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

44. The method of claim 41, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with voltages of no more than about 100 V.

45. The method of claim 41, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with a cathode-to-gate distance of not more than about 1 micron (1 μm).

46. A method comprising:

operating a field emitter array (FEA) with voltages of no more than about 1000 V to generate at least one of a high electric field and a high electron flux;

exposing the field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

ionizing the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

47. The method of claim 46, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

48. The method of claim 46, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

49. The method of claim 46, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with voltages of no more than about 100 V.

50. The method of claim 46, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with a cathode-to-gate distance of not more than about 1 micron (1 μm).

51. A method comprising:

operating a field emitter array (FEA) with gate openings in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm) to generate at least one of a high electric field and a high electron flux;

exposing the field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

ionizing the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

52. The method of claim 51, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

53. The method of claim 51, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

54. The method of claim 51, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with voltages of no more than about 100 V.

55. The method of claim 51, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with a cathode-to-gate distance in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm).

56. A method comprising:

operating a field emitter array (FEA) with voltages of no more than about 1000 V with gate openings in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm) to generate at least one of a high electric field and a high electron flux;

exposing the field emitter array (FEA) to at least one of a chemical toxin and a biological toxin; and

ionizing the at least one of the chemical toxin and the biological toxin exposed to the at least one of the high electric field and the high electron flux.

57. The method of claim 56, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electric field having a field strength in a range of about 10^7-10^8 V/cm.

58. The method of claim 56, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) to generate an electron flux in a range of about 0.5-2.0 Amp/cm^2.

59. The method of claim 56, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with voltages of no more than about 100 V.

60. The method of claim 56, wherein operating the field emitter array (FEA) comprises operating the field emitter array (FEA) with a cathode-to-gate distance in a range of about 1 micron (1 μm) to about 1 millimeter (1 mm).